Information Technology and Libraries, 1988, Vol. 7, No. 2, p.131-138.
ISSN: 0730-9295
http://www.ala.org/
http://www.ala.org/lita/ital/

Management Information Gleaned from Automated Library Systems

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One of the functions of automated library systems is to provide management information to aid in decision making. The increase in size and complexity of library operations means that managers need an effective system to supplement information gained through direct observation. Management information generated by automated library systems in collection development, acquisitions and serials, cataloging, the online catalog, and circulation is discussed. Specific examples and their use are provided.

Edwin Cortez has defined an automated library system by its capacity to store "the library's files in a common database which is accessible through a common protocol and command language. The integrated system supports circulation, acquisitions, and cataloging activities, and for management's use generates reports for each of these activities."[1] Most automated library systems are designed with a dual function in mind—to support day-to-day library operations and to provide managers with useful information to aid in decision making. Therefore, systems must be evaluated not only for how effectively they handle day-to-day operations but also for their ability to manipulate and generate information for management.[2] It is this last function—management information—that will be the focus of this article.

Management and the consequent need for management information exists at all levels of policy and responsibility within an organization. The services offered by libraries have increased dramatically with the advent of technology. The resulting increase in the size and complexity of library operations has meant that most managers need an effective system to supplement information gained through direct observation. There can be little doubt that the more one knows, the better one can manage. The essence of good management is good information. In this sense, management as a function can be defined as interpretation of information so that appropriate decisions can be made.[3]

It is important to stress, however, the distinction between data and information. Data are nothing more than series of facts extracted for use by an individual. Information is the meaning derived from data by an individual.[4] Computers can generate reams of printouts containing massive detail. Such excesses can work against, rather than in favor of, competent decision making.[5] It is important to ignore transactions that fall within normal parameters and concentrate, instead, on the abnormalities and determine the reason for their deviance. These exceptions can point to problems in work flow or procedures that can be simply rectified before the problems get out of control. In other words, internal problems can be identified and corrected before the public is affected by them. Information overload can occur if computers are used carelessly, but when used appropriately, computers can process large sums of data rapidly and focus attention on items of concern. At the same time, it is important to be sure that the cost of collecting and analyzing data

does not exceed the information's usefulness.[6]

The types of reports generated by automated library systems fall into four broad categories: statistical, exception, on-demand, and predictive. Computers are well equipped to provide this information because they were originally designed to be, and still primarily are, number crunchers.

STATISTICAL REPORTS

Manually derived statistics are labor-intensive and subject to error. They often lack sufficient currency and completeness to be truly useful. Two obvious advantages of using automation to compile statistics are the increased reliability of the numbers and the decreased staff time required to compile them. Automation permits analysis of operations never before feasible. Periodic reports provide routine, statistical information in detailed or summarized form. Not only can activities or transactions be counted, but they can be aggregated by time period and/or location, for example, and by numbers of items acquired, circulated, or cataloged. Statistical reports can also provide information based upon such factors as the time to acquire an item, to catalog materials, or to complete an interlibrary loan. Automation can also generate statistical reports in the form of ratios and percentages, such as the percent of registered borrowers who use the library monthly.[7]

EXCEPTION REPORTS

Exception reporting has been mentioned earlier in terms of locating items outside of normal parameters. Exception reports highlight areas requiring managerial attention. For example, a list of *all* books sent to cataloging would not focus on those that have been overlooked or lost. The overdue in cataloging report, on the other hand, provides the exact focus required. Only those titles not cataloged within a given time period are reported. The Geac system is built upon exception reporting. Most functions within the system operate on a series of action dates. Once this action date has passed without the appropriate action being taken, the item appears on the relevant exception report. The item will remain on the report until the exception has been resolved. Therefore, reports can be reprinted on a periodic basis and will only report the exceptions not yet resolved.

ON-DEMAND REPORTS

On-demand reports provide a response to a particular nonstandard question. For example, such a query might be, How many books in the TX classification have circulated in the last semester? The common feature of on-demand reports is that they are produced in response to a particular inquiry and not on a regular basis. These reports often employ Boolean logic or are part of a piece of software known as a report generator. Report generators are becoming a common feature in integrated library systems. They enable the library to specify the data elements to be included in the report and the format or sequence to be used. The generators do not require a knowledge of programming, and it is almost impossible to damage the database or software since the program extracts, but does not update or modify, files in the database.

PREDICTIVE REPORTS

Predictive reports give forecasts and provide comparisons based on statistical manipulation of data. These reports provide information on how the library is doing as compared to previous years, what trends are emerging, where activity growth is occurring, or how the library relates to other similar libraries. For example, a library may know that interlibrary loan lending has increased 48 percent. What is unknown is whether this is the result of improved service (i.e., timeliness), institution of interlibrary loan fees by other libraries, or improved collection development. Although this type of information is of primary interest to high-level management, it also has applications at the middle-management level. For example, predictive reports can project work flows and predict slow periods when staff need to be reallocated. In addition, predictive reports can often assist managers with "what if" situations[8]. For example, if the materials budget were reduced 8 percent, how would that affect resources for serials and other materials? Historical data can help assess the impact this change might have on a library and its operation and the consequences of alternative actions. However, it is important to remember that the system never makes the decision; it only provides the framework and data within which the manager must make the decision.

AUTOMATED LIBRARY SYSTEMS

Library school professor Jean Tague states that

> the greatest potential for management information from automated systems lies in the control and planning of individual subsystems. Automated subsystems provide the capability for a kind of analysis of operations never before feasible by an over-worked library staff.[9]

Management information was often an afterthought in early automated systems. However, decision making has become such a critical part of everyday library management that systems are now being designed with management information components from the very beginning. Library management in the areas of collection development, acquisitions/serials, cataloging, the online catalog, and circulation can be greatly enhanced by the use of management information.

COLLECTION DEVELOPMENT

Although there is no collection development subsystem in any current integrated library system (ILS), collection development can be well served by the information available from the circulation and acquisitions modules. One of the goals of collection development is to provide materials in advance of requests. Therefore, one of the most important pieces of information in improving collection development is determining how much the existing collection is used. A University of Pittsburgh library study showed that only 56 percent of newly acquired materials actually circulated. Heaviest use occurred in the two years following acquisition; if a book has not

circulated within five years of acquisition, it probably never will circulate. Obviously, more extensive analysis of circulation data is warranted in order to improve collection development.[10]

Several reports in most integrated library systems can address these issues. The first report covers the circulation statistics by patron types. This report generates information on the category of patrons using the library. These categories are usually defined by the individual library when the system is installed and can be extremely detailed if desired.

The second report—checkouts and renewals by call number range—compiles statistics on those ranges most heavily circulated. Such information is indicative of emerging trends and research interests. Depending upon the level of detail in the report, definite trends can be determined by comparing data from several semesters. Both of these reports can be used by collection development to redefine and reevaluate collection policies and goals.

Circulation systems can also provide useful information in the area of high-demand material. If books on a particular subject are in high demand and attract frequent holds, additional purchases may be justified. The in-house library system at Bell Laboratories produces a weekly "Titles in Demand List" to identify all titles for which five or more people are waiting. Supervisors then hold a weekly conference to determine additional purchases necessary to meet demands and keep response time short. The Geac system has a similar report—the Holds/Purchase Alert Report—which allows each library to set the number of holds that will trigger the alert. Full bibliographic information is generated and forwarded to collection development for a decision.

At the opposite extreme, systems can generate lists such as Bell Labs' "Zero Activity Report" to identify titles that have little or no use in a given time period. In addition to the time period, location and subject area can also be limited on such reports. Unusually low use may call for increased user education or more publicity. On the other hand, as more libraries face weeding and storage decisions, such an analysis of circulation data can enhance those decisions. Unfortunately, some systems cannot report items that have never circulated.

ACQUISITIONS/SERIALS

The term *acquisitions* encompasses every aspect of obtaining materials for libraries. Materials can be acquired by purchase, gift, or exchange. Even though libraries approach this process from many perspectives, automation has greatly improved the service and efficiency of such operations.

Financial management is one area of acquisitions where automation has yielded marked improvements. Systems such as Geac and Innovacq recognize the library's need for double bookkeeping or hierarchical breakdowns within accounts. This allows libraries to report expenditures to their parent accounting bodies in general terms as well as to maintain detailed internal subject and format breakdowns. Not only are detailed breakdowns accommodated, but encumbrances and expenditures are updated in real time or—in the worst case—overnight, requiring no human tabulation. Based upon this capability, financial reports can then be generated in a format suitable for general circulation. In addition to basic information such as budget, expenditures, encumbrances, and free balances, most systems can tabulate such things as the percent encumbered/expended or a comparison between current and prior year expenditures.

Currency conversion has long been a problem for library accounting divisions. The estimated prices of titles can be entered in a foreign currency, and the system will automatically convert and encumber funds in U.S. dollars. As conversion rates fluctuate, the new rate can be entered as often as necessary. At that time, each outstanding encumbrance is recalculated at the

new rate. The Geac system generates two management reports in the conversion process—one reports the plus/minus difference in each currency, and the other reports how the change has affected each individual fund.

Projecting the cost of serials consistently poses one of the most complex financial management problems. The rising cost of serials demands close managerial attention. Nationwide studies can provide an average inflation rate, but this average may be seriously inaccurate given a library's particular mix of serials. Automated systems enable libraries to record and maintain an invoicing history for multiple years. This invoicing history can report year-to-year inflation rates. The Geac system then uses a complicated weighing formula to project costs on a title-by-title basis. This weighing formula takes into account the latest subscription period and gives greater emphasis to the most recent payments. Recently, several major subscription vendors such as Faxon have also developed systems to provide this information. However, few libraries, if any, maintain all standing orders with a single vendor. Therefore, it is important that local systems be designed to provide this information. With in-house systems, records can be manipulated to report data in various combinations, such as by fund, by departments or college, or by geographic source of publication.

Vendor performance reports summarize average order costs, discount percentages, delivery times, and the number of claims and cancellations. The usefulness of such reports to management is in renewing purchase orders and maintaining effective supply sources. However, it would also be useful if systems were designed to report the vendors who exceed a particular delivery time rather than only producing detailed reports on how long each vendor takes to deliver the average order. This is an example of isolating the exceptions rather than reporting all of the normal parameters.

Order control is the final area of acquisitions where management information has increased and improved with the advent of automation and where exception reporting becomes particularly useful. NOTIS as well as many other systems can produce on-demand lists of all active orders. For example, titles that have not been received by their estimated delivery date can be extracted and investigated by staff. In some cases, automatic claims can be generated from such extractions. Systems such as NOTIS can compose letters for common conditions such as claims, cancellations, or credit requests. Terminal operators need only enter mnemonic codes, which the system explodes into full-text paragraphs. NOTIS can even print these messages in languages other than English. The Bell Labs' system generates the "In Process File Scoreboard," a report that permits a manager not only to determine how many items are in any given status, such as on order, but also to compare the current status with an earlier date, such as last month.[11] Such a comparison enables the manager to determine if progress has been made in eliminating backlogs. Acquisitions practices vary so widely in libraries that it is a tribute to automation vendors that recent acquisitions systems have become so successful in meeting library expectations for management information.

CATALOGING

Management reports available from the cataloging subsystem of an ILS are oriented primarily toward work-flow analysis. Records that do not meet certain standards are bounced from the process to be reviewed. Because of the complex flow of new cataloging, on-order records, and authority records, a sound series of management reports is required to manage the work flow.

One of the almost immediate uses of cataloging reports is in estimating the amount of time

required for completing the initial database load. A university in the U.K. used its initial data entry statistics to predict completion of the task. Dates for making the system available to the public were then projected, and a public relations campaign planned.

> The fact that this operation could be constantly monitored and targets redefined in order to achieve success attests to the value in having detailed and accurate information, thereby enabling management to know exactly what progress was being made.[12]

Most cataloging databases are built by tape loading of OCLC or other machine-readable records. Once this initial load is accomplished, however, new cataloging or retrospective conversion titles are merged into the database through some type of interface. In order to maintain the integrity and quality of the database, transferred records are run through a series of checkers. Items not meeting all of the appropriate standards are printed in brief bibliographic form. This proof list (as it is called by Geac) uses an asterisk to identify the tag where the problem exists. Standard error codes are employed, and after corrections are completed the record will be sent back through the series of checkers. If no further errors are found, the record will be added to the database.

Beyond this, the successful day-to-day operations of processing work flow depend upon a number of management reports. Of particular use in managing the large, specialized subject headings authority database is a periodic printout of all headings used within a given class number. Two NOTIS reports—the "New Subject Headings List" and the "Dropped Subject Headings List"—provide cataloging staff with a way to maintain catalog integrity. Staff can use these lists to prompt postcataloging authority work. The ease with which authority work can be managed has been greatly enhanced by automation. Individual headings can be changed throughout the system in a global update with a minimum of effort. Lists of such changes can be used to notify member libraries in a network environment of how headings have changed.

THE ONLINE CATALOG

Catalogs are the key to library collections, and understanding their use could serve as the key to understanding library use. For the first time it is now possible to study, on a routine basis, how patrons use the catalog. The essential ingredient for catalog-use assessment is the ability to record searches automatically for subsequent analysis. Transaction logs are the standard mechanisms for recording this data. Such logs are records of the computer dialogue between the user and the catalog. Monitoring is achieved directly and unobtrusively. Because most catalogs are not passworded, personal identification is impossible, and the privacy of the individual is preserved.

Various statistics can be compiled through analysis of the transaction file. Because only transactions are recorded, reports do not show data from a period when a terminal has not been used. Statistics are subdivided by terminal, by hourly periods, and, within each hour, by type of search or activity. It is therefore possible to see how many searches, in a given hour, were performed on a particular terminal and whether they were searches by author, title, subject, etc. The use of function keys and major functions can also be analyzed. In one such analysis, the University of Sussex Library discovered that the popularity of a new search technique was rising. This particular search method could not be performed with a card catalog. Therefore, it is significant that about 70 percent of the time users chose a type of search that would not have been possible in

the card catalog.[13]

Beyond the obvious advantages of learning more about library users, transaction logs can be used to improve the design of the online catalog. Improvements in screen layouts and filing sequences can be prompted by user studies. Summaries of transactions provide information useful in deciding on terminal placement, improving screen effectiveness, and determining the need for cross-references. In a recent book on the Geac system, Duncan Westlake succinctly states that transaction logs are

> another example of the way in which an automated system can be made to produce genuinely relevant statistics, with the possibility that decision making can be made more reliable in the light of better information.[14]

CIRCULATION

Circulation control is concerned with issuing, returning, and reserving materials and identifying overdue items. The software designed for circulation must provide for the creation of printed output and financial control. It is an especially rich source of management information. The information available relates to individual books, categories of items, categories of readers, and transaction activity.

As mentioned in other sections, work flow and staffing analysis are natural byproducts of automated systems. Most systems produce a daily operations report providing a history of all transactions of the previous day and statistics for the various circulation activities. The report provides information for any follow-up work the staff needs to do and enables them to monitor circulation activity. This allows a library to analyze busy times, since most reports are subdivided by hourly periods. For example, a daily operations report has potential for dynamic staffing of small branch libraries by allocating staff to cope with anticipated peak periods. Also, work that tends to degrade the response time of the system can be scheduled during slack periods when the system is not heavily used.

Borrower activity can be scrutinized in much the same way as catalog use. The Geac system provides for patron extract programs, which function using Boolean operators. The library can define a number of criteria, then either list or count the number of patrons who meet them. Information that can be defined includes such items as whether the borrower's privileges have been suspended, whether the borrower has overdue books, and whether the borrower has an incomplete address. Combining some of these items results in reports comparing such things as active versus inactive borrowers or which patrons registered at one branch are borrowing extensively from another.

Most systems now have a variety of programs dealing with hold management and class reserve capabilities. A *hold* is defined as the process by which a patron is notified that a requested item is available and can be picked up at the library. In addition to reporting the number of holds placed, systems can report the number of items not picked up. This information can be analyzed to determine which patrons are not picking up holds in order to see if there are notification or other problems with the process. In addition, the library can keep track of the number of holds not satisfied.

In an academic setting, reserves are an integral component of a circulation system. Geac's report, the "Weeding and Stamping List," automatically places on or removes items from reserve. This is a powerful program that operates on activation and expiration dates to provide automatic

updating. A list of the actual items can be printed, which is then used to pull items to be placed in the reserve room or as a listing of what is currently on reserve.

A second report, the "Reserve Use Report," is arranged by course number and professor's name. It is designed to give professors information on which items placed on reserve are used and which are not. The circulation count as well as the reshelve count is reported. These can be presented to faculty to encourage them to consider the usefulness of some of the titles on reserve.

Automated circulation systems allow libraries to track material more closely, particularly those items declared missing. When an item is declared missing, it can be updated in the system. Lists can be generated to facilitate searching for these titles. The reason for the missing status is included as well as the length of time the item has been lost. Both NOTIS and Geac notify through reports when missing items have reappeared. In such a case, a refund may be warranted. A list of patrons eligible for refunds can be produced. This permits the library to make a refund when a book paid for by a patron simply shows up.

After a certain length of time, items may be declared permanently lost. They can be purged from the circulation system and then forwarded to cataloging for permanent withdrawal. The list could then be sent on to the collection development staff for replacement decisions if this was not done at an earlier stage.

Fine policies vary widely among libraries, but all libraries must contend with the problem of overdue material. At the very least, overdue and recall notices can be generated through most systems. The system should also provide for detailed information concerning fines or replacement bills. In addition, the library must be able to block patron usage through the system when financial obligations reach certain levels. More and more often, libraries are including specifications in bid documents requiring programs to transfer financial information from the system to the university business office. This linking can be extremely beneficial for libraries. After implementing such a process, the University of Houston's success rate at retrieving long overdue items or replacement fees increased significantly.

CONCLUSION

An important aspect of any automated library system is its ability to produce information about how the system is being used. Much of the enthusiasm for automated systems comes from the power and responsiveness of the systems in providing data. Automation makes large quantities of raw data almost instantaneously available to managers. Interconnected systems are also able to realize relationships between information that might not be apparent in manual systems. It is important to bear in mind that a primary purpose of automation is to assist library management in allocating resources, selecting alternatives, and providing timely information. To work effectively, the manager's information needs must be well thought out and documented so that relevant information is generated.

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